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Telephone (604) 536-1154

CONSULTING
GEOPHYSICISTS

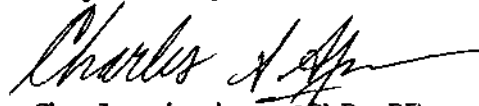
15423 34th Ave.
Surrey, B.C. Canada
V3S 4N7

GOLDSTREAM GRAVITY SURVEY

SUMMARY

The results of the gravity test survey over the Goldstream Property of Noranda Exploration Co. Ltd. are presented here. All work was done 'blind' without the benefit of any information about the geology or the location of the Goldstream deposit. The results of the gravity work are therefore an unbiased appraisal of the usefulness of gravity to outline massive deposits in rugged terrain areas. The results speak for themselves.

Respectfully submitted,


Charles A. Ager, PhD, PEng.

July 19, 1977

Geophysicist

MINERAL RESOURCES BRANCH ASSESSMENT REPORT 6696 NO. _____

**PART 2
OF 2**

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LOCATION - DATE OF WORK - CREW

LOCATION: Goldstream Property

Goldstream River area, B.C.

51°37.52' N Latitude, 118°25.86' W Longitude

NTS 82M/9w

DATE OF WORK:

Field Work: June 21 - June 28, 1977

Office Work: July 1 - July 19, 1977

CREW:

Charles A. Ager, PhD, PEng., data interpreter

Douglas R. MacQuarrie, BSc, geophysicist/party chief

Alan Watson, observer

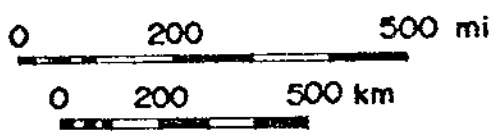
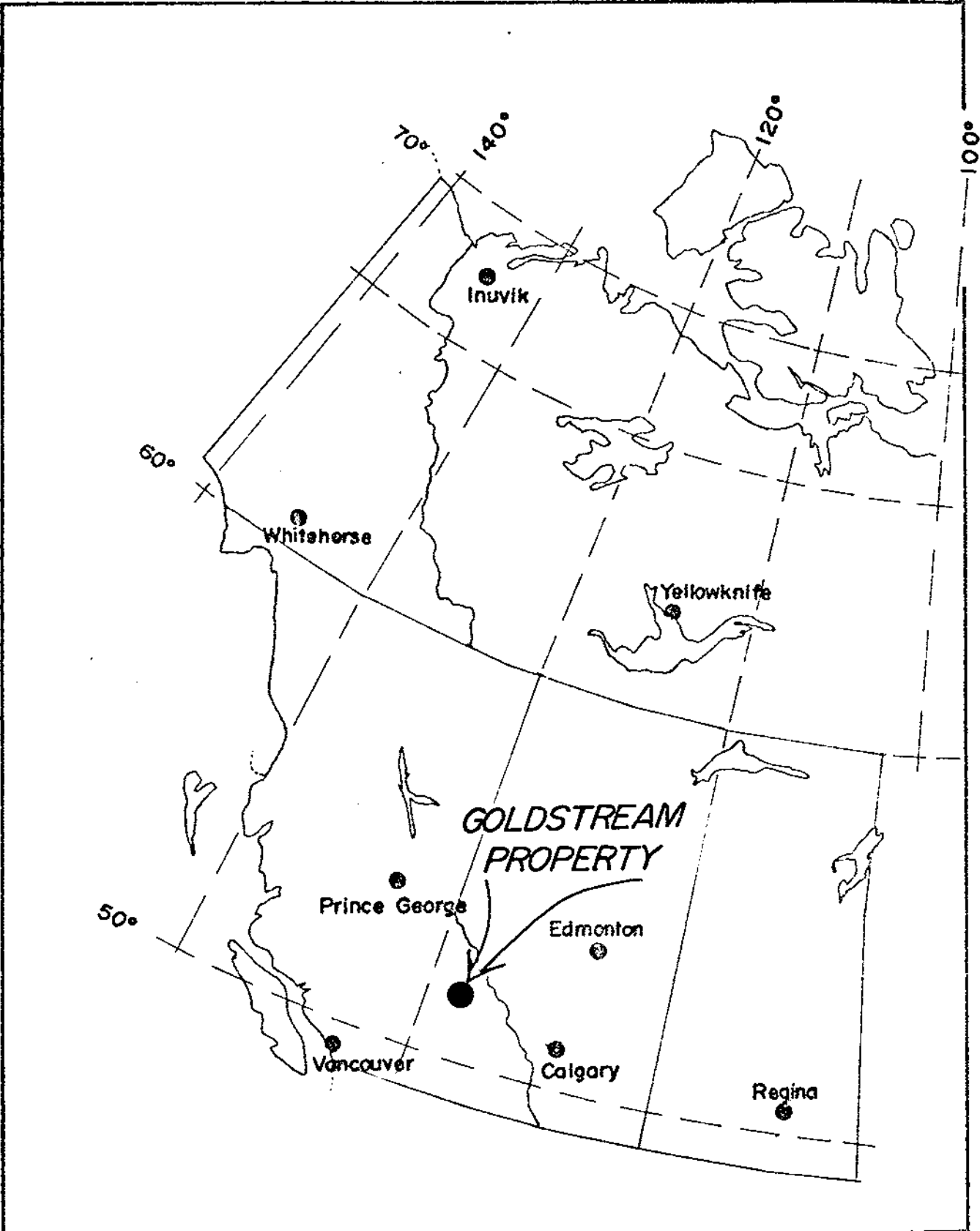
Howard Moskaluk, geophysical assistant

INTRODUCTION

At the request of Mr Tom Walker, Noranda Exploration Co. Ltd., a gravity test survey was conducted over a part of the Goldstream Property, Goldstream River area, B.C. The intent of the work was to evaluate the usefulness of gravity as a tool to outline massive sulphide bodies within rugged terrain areas such as this property. To ensure that the results of the work would remain completely unbiased, no prior information concerning the geology of the area or the ore deposit were supplied to the contractor. The data presented here represents the results of the gravity survey work. All interpretation was done completely 'blind' and represents a fair appraisal of what information can be derived by looking only at the gravity field.

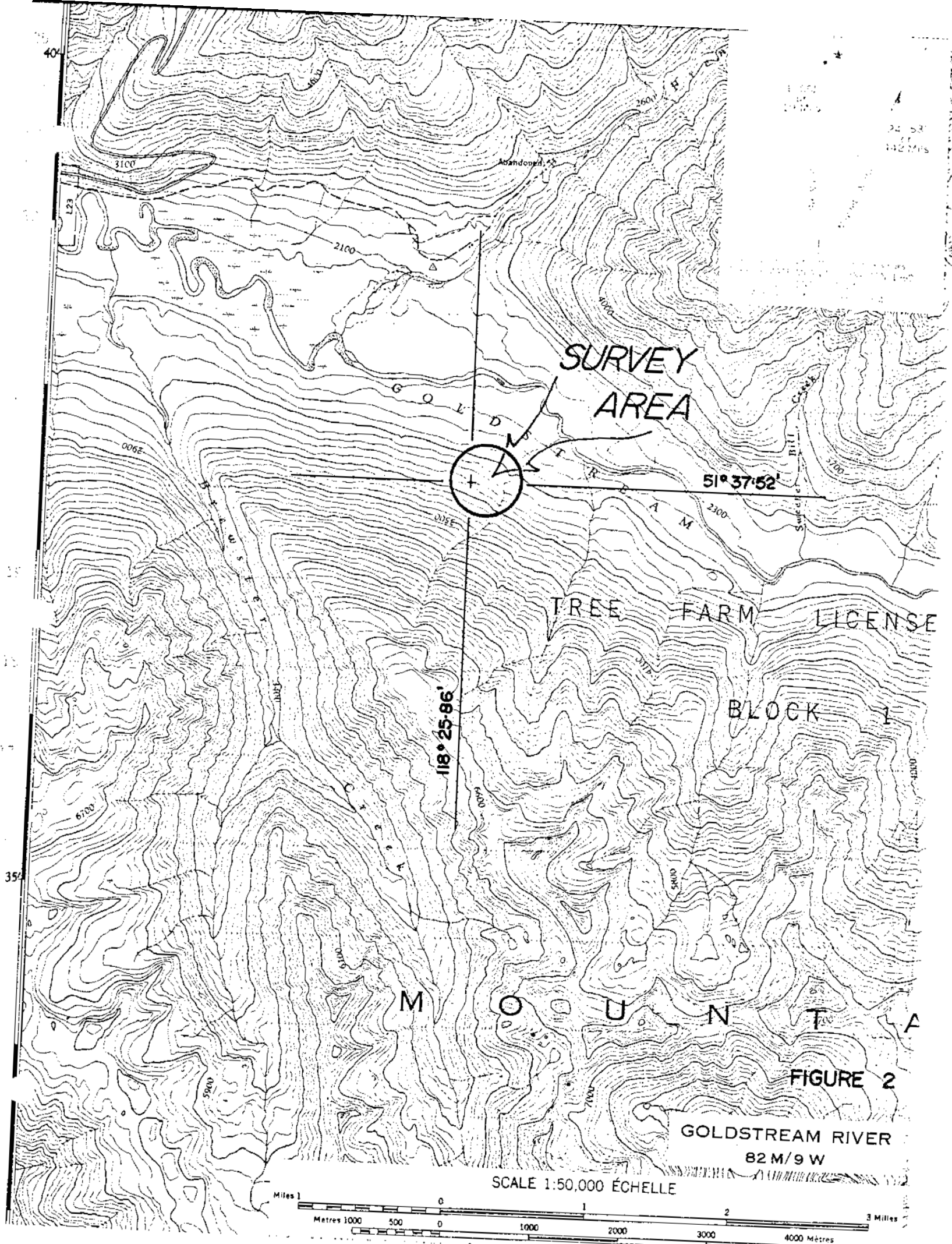
INSTRUMENTATION & SURVEY PROCEDURES

Gravity observations were made using a LaCoste & Romberg Model G gravity meter (Serial No. 209) with reading accuracy of ± 0.01 mgal. All gravity observations were within the dial range 4250-4350 for which the instrument constant is 1.05965 mgal/division. Instrument and diurnal drift were accounted for by tying into known base stations within three hour intervals.



<i>LOCATION MAP</i>	
GOLDSTREAM GRAVITY SURVEY	
DATE JULY 1977	C-A AGER & ASSOC. Surrey B.C. Canada

FIGURE 1



34 58
142 M/S

SURVEY
AREA

51° 37' 52"

TREE FARM LICENSE

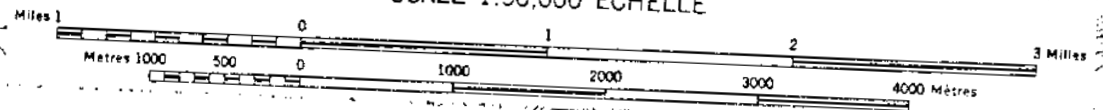
BLOCK 1

MOUNTAIN

FIGURE 2

GOLDSTREAM RIVER
82 M/9 W

SCALE 1:50,000 ÉCHELLE



Gravity stations were located at 25 meter intervals along lines spaced 100 meters apart as shown on Figure 3. In the survey area, it is very precipitous with thick undergrowth and dense stands of 'devil's club'. The survey lines were previously marked by flagging but not cut. The steep terrain combined with the overbearing undergrowth made the survey work very hazardous, tedious and slow. Nevertheless, station elevations were determined by standard levelling methods using an electric level developed by Ager & Associates Ltd. Station elevations were measured to an accuracy of ± 0.03 meters or better. Loop closures were made between each line with additional control from drill collar elevations.

The survey is referenced to two permanent base stations established within the survey area. These stations are called GB77-7 and GB77-8. Each station is marked by a red painted post on which is carved the station number. The absolute value of the gravity field for each base was determined by an ex-center tie to the National Network station at Revelstoke, B.C. The observed gravity values so determined are listed below with additional parameters given in Appendix A.

<u>Station Number</u>	<u>Location</u>	<u>Observed Gravity</u>
9049-68	Revelstoke, B.C.	980,889.39 mgal
GB77-7	Mining Corp. Camp	980,904.76 mgal
GB77-8	14800E + 2100N Goldstream Grid	980,854.78 mgal

The elevation datum for the survey was determined by assigning 863.98 meters to GB77-8 as measured from drill collar elevation 863.97 meters for drill hole NG6. The latitude and longitude co-ordinates for GB77-8 were scaled from the 1:50,000 map sheet for the area and are shown on Figure 2.

DATA REDUCTION

As is well known, the observed gravity values (g_0) contain much information of non-interest in exploration geophysics. Simply stated, the problem is to separate the unwanted effects of the earth (g_E) from the observed gravity field. The map of interest, the Complete Bouguer Gravity Map (Δg_{CB}) is defined as follows:

$$\Delta g_{CB} = g_0 - g_E \quad (1)$$

where

$$\epsilon_E = \epsilon_L + \epsilon_{FA} + \epsilon_{BS} + \epsilon_T \quad (2)$$

\uparrow Latitude effect \uparrow Free Air effect \uparrow Bouguer Slab effect \uparrow Terrain effect

Using standard procedures, the Complete Bouguer Gravity Map (Figure 4) was calculated by Equation 1 above. Terrain effects were calculated to a radius of 500 meters using computer techniques of Ager & Associates Ltd. Bouguer slab and terrain densities were taken as 2.80 g/cc as determined from density measurements on the phyllitic rocks which are presumed to underly the survey area. The complete Bouguer gravity values are all relative to base station GB77-8 which was assigned an arbitrary value of 167.78 mgals. A complete listing of the gravity data is given in Appendix A.

THE GRAVITY MAPS

The gravity survey was conducted over a portion of the Goldstream grid as specified by Noranda personnel. Previous drilling and underground work has outlined a massive copper deposit within the area surveyed. Density measurements on the ore and host rocks were made as follows:

phyllite (host rock)	2.79 g/cc
phyllite (hanging wall rock)	2.82 g/cc
ore (massive)	3.78 g/cc
ore (disseminated)	3.19 g/cc

As can be seen from the above density information, there is a healthy contrast of about 1.0 g/cc between phyllitic host and massive ore rocks. This is most certainly sufficient to give a gravity high response of more than 0.50 mgals.

The elevation and complete Bouguer gravity maps are given on Figures 3 and 4 respectively. Inspection of the C.B. gravity field indicates a regional gravity gradient of about 0.60 mgals per 100 meters southwest. This gradient was removed from the C.B. gravity map to yield the Residual Gravity Map, Figure 5. The plane equation for the regional field determined by LMS fit to the data is:

$$g_R = 173.33 - 0.13685X - 0.43745Y \text{ mgal} \quad (3)$$

where

X,Y are E,N grid co-ordinates in 100's meters.

INTERPRETATION OF RESULTS

Inspection of the C.B. Gravity Map, Figure 4, indicates that the trend of the underlying rock units is northwest-southeast. These same units increase in density towards the south as evidenced by the increase in gravity gradient in this area. The large bulge in the gravity contours, centered at 15200E+2400N, most certainly marks the presence of the Goldstream massive sulphide deposit. The body trends to the northeast and dips in the same direction.

After removal of the regional field, a Residual Gravity Map (Figure 5) more clearly points out the aforesaid features and amplifies other anomalies. It is important to realize that there is insufficient gravity coverage over and around the massive sulphide deposit to allow for a good estimate of the residual anomaly associated with it. The only recourse, for this project, was to remove a planer field from the data. The residual map should therefore be treated as 'a' residual map with the inherent assumption that as more data is available it will be improved. Even with these restrictions on the data the following interpretation is made with good certainty:

- (1) The gravity high anomaly of 0.80 mgals, centered at L5200E+2400N and trending through L5300E+2550N, clearly indicates the subsurface position of the Goldstream massive sulphide orebody.
- (b) The fact that the gravity high anomaly is still open to the north is interpreted to mean that the massive source extends to the northeast off the survey area.
- (c) Using the 0.0 mgal contour as the outer limit of the gravity field due to the ore body, and 2.8 g/cc for host rocks, and 3.8 g/cc for ore the total tonnage associated with this anomaly is greater than 0.46 million tons. However, since the rocks on the foot and hanging walls of the deposit are denser (about 3.19 g/cc), than the host rocks, the tonnage estimate for the more massive part should be down graded by their relative volume extents. Allowance should be made for the fact that the anomaly represents only part of the ore body as well. This tonnage estimate is therefore only a rough estimate.
- (d) The fact that the anomaly opens toward the northeast indicates that the body dips, at a small angle to the ground surface, in this direction.

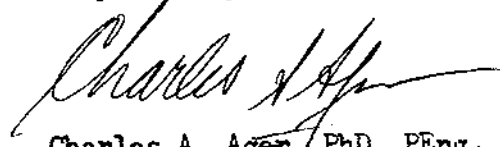
- (e) There is a sharp gradient on lines 5100E to 5300E at about 2325N. This indicates that the ore either thickens or increases in density or both to the northeast from this region.
- (f) There are two smaller gravity high anomalies of amplitude 0.30 mgals centered at 14900E+2125N and 15200E+2000N. Each of these features is very local in extent but could represent smaller pockets of massive mineralization or heavier rock units. Correlation of these targets to the known geology should explain the exact nature of the sources.
- (g) The gravity high zone extending to the south of 1900N on lines 4800E - 5300E should be investigated further. Preliminary information suggests that it is caused by an increase in density of the underlying rocks. This may indicate a rock unit denser than 2.80 g/cc, or it could signal the beginning of another zone of mineralization.
- (h) The gravity low features of the map are not deemed to be important at this time. Likely explanations for them are increases in overburden depths and/or less dense rock units.

SUMMARY & CONCLUSIONS

The results of the gravity survey work clearly indicate the presence of the massive Goldstream deposit. Although the author of this report is basing the interpretation solely on the gravity data, the gravity evidence is so clear and self-evident that the results are expected to be quite accurate. More refinement can be made to the interpretation with geological and drill core input.

Further gravity work is recommended over the ore deposit as a method of mapping its sub-surface dimensions and as a method of calculating the overall tonnage of the deposit.

Respectfully submitted,



Charles A. Ager, PhD, PEng.

Geophysicist

July 19, 1977

APPENDIX A

GOLDSTREAM GRAVITY DATA

Elevations in meters, gravity in mgals

STATION NUMBER	ELEVATION	OBSERVED GRAVITY	C. BOUGUER GRAVITY
GB77-7	634.06	50.02	-
GB77-8	863.98	0.0	167.78
1750N 480CE	998.03	-25.20	169.86
1775N 4800E	989.26	-23.45	169.66
1800N 4800E	979.91	-21.64	169.49
1825N 4800E	970.44	-19.80	169.37
1850N 4800E	963.77	-18.69	169.13
1875N 4800E	958.79	-17.90	169.07
1900N 4800E	945.01	-15.38	168.91
1925N 4800E	930.54	-12.81	168.67
1950N 4800E	922.46	-11.22	168.57
1975N 4800E	911.93	-9.23	168.43
2000N 4800E	900.00	-6.87	168.27
2025N 4800E	890.97	-4.99	168.35
2050N 4800E	881.88	-3.34	168.13
2075N 4800E	876.93	-2.38	167.98
2100N 4800E	863.98	0.0	167.78
2125N 4800E	860.50	0.82	167.81
2150N 4800E	858.34	0.93	167.60
2175N 4800E	846.92	3.19	167.63
2200N 4800E	837.01	5.00	167.53
2225N 4800E	826.56	7.02	167.44
2250N 4800E	818.26	8.61	167.27
2275N 4800E	810.23	10.10	167.23
2300N 4800E	801.87	11.61	167.06
1750N 4900E	1005.44	-26.66	169.88
1775N 4900E	994.45	-24.63	169.62
1800N 4900E	982.89	-22.35	169.46
1825N 4900E	973.95	-20.66	169.25
1850N 4900E	969.36	-19.81	169.21
1875N 4900E	959.45	-18.18	169.00
1900N 4900E	945.25	-15.55	168.86
1925N 4900E	933.46	-13.46	168.58
1950N 4900E	923.10	-11.41	168.47
1975N 4900E	912.78	-9.46	168.29
2000N 4900E	904.18	-7.68	168.24
2025N 4900E	896.57	-6.12	168.20
2050N 4900E	892.57	-5.36	168.21
2075N 4900E	882.43	-3.44	168.09
2100N 4900E	873.21	-1.80	167.93
2125N 4900E	865.93	-0.38	167.98
2125AN 4900E	855.87	1.43	167.79
2150N 4900E	845.88	3.13	167.56
2175N 4900E	832.55	5.54	167.33
2200N 4900E	822.72	7.35	167.13
2225N 4900E	813.97	9.00	167.00
2250N 4900E	805.69	10.57	166.88

2275N	4900E	797.33	12.13	166.74
2300N	4900E	788.89	13.69	166.60
2325N	4900E	780.11	15.28	166.39
2350N	4900E	771.26	16.86	166.16
2375N	4900E	762.32	18.48	165.95
2400N	4900E	753.18	20.24	165.86
1750N	5000E	1000.63	-25.07	169.78
1775N	5000E	990.17	-24.04	169.50
1800N	5000E	981.91	-22.40	169.28
1825N	5000E	975.53	-21.29	169.03
1850N	5000E	966.03	-19.44	169.07
1875N	5000E	957.04	-17.88	168.95
1900N	5000E	942.76	-15.40	168.59
1925N	5000E	932.40	-13.42	168.45
1950N	5000E	922.00	-11.37	168.37
1975N	5000E	912.80	-9.62	168.23
2000N	5000E	902.77	-7.66	168.15
2025N	5000E	891.88	-5.65	167.95
2050N	5000E	881.57	-3.67	167.84
2075N	5000E	873.29	-2.11	167.70
2100N	5000E	864.15	-0.44	167.56
2125N	5000E	858.16	0.58	167.40
2150N	5000E	844.28	3.20	167.29
2175N	5000E	837.01	4.66	167.27
2200N	5000E	827.72	6.49	167.21
2225N	5000E	820.44	7.86	167.07
2250N	5000E	810.81	9.62	166.89
2275N	5000E	802.39	11.19	166.72
2300N	5000E	793.23	12.94	166.62
2325N	5000E	785.30	14.34	166.39
2350N	5000E	779.19	15.60	166.35
2375N	5000E	776.14	16.26	166.31
2400N	5000E	769.04	17.61	166.23
2425N	5000E	761.92	18.99	166.16
2450N	5000E	758.40	19.78	166.19
2475N	5000E	753.99	20.61	166.12
2500N	5000E	745.89	22.06	165.96
1750N	5100E	1001.51	-26.19	169.70
1775N	5100E	992.68	-24.57	169.41
1800N	5100E	984.80	-23.08	169.30
1825N	5100E	975.96	-21.58	169.12
1850N	5100E	963.03	-19.24	168.95
1875N	5100E	948.69	-16.57	168.77
1900N	5100E	936.47	-14.26	168.58
1925N	5100E	924.19	-11.90	168.41
1950N	5100E	915.18	-10.15	168.26
1975N	5100E	905.34	-8.25	168.12
2000N	5100E	896.29	-6.61	167.91
2025N	5100E	887.12	-4.78	167.89
2050N	5100E	880.83	-3.68	167.70
2075N	5100E	870.16	-1.69	167.56
2100N	5100E	859.68	0.33	167.48
2125N	5100E	854.63	1.26	167.37
2150N	5100E	842.07	3.67	167.24
2175N	5100E	833.54	5.30	167.09
2200N	5100E	826.94	6.56	166.92
2225N	5100E	818.88	8.13	166.79
2250N	5100E	811.82	9.59	166.76
2275N	5100E	807.95	10.30	166.61
2300N	5100E	801.21	11.78	166.69

2325N	5100E	797.06	12.58	166.64
2350N	5100E	792.05	13.66	166.75
2375N	5100E	787.77	14.37	166.68
2400N	5100E	781.29	15.53	166.60
2425N	5100E	773.72	16.95	166.57
2450N	5100E	768.48	17.90	166.55
2475N	5100E	755.99	20.12	166.22
2500N	5100E	743.58	22.33	165.96
1750N	5200E	996.37	-25.23	169.65
1775N	5200E	986.14	-23.40	169.39
1800N	5200E	975.15	-21.36	169.24
1825N	5200E	967.09	-20.02	168.97
1850N	5200E	955.01	-17.89	168.69
1875N	5200E	940.71	-15.23	168.45
1900N	5200E	929.89	-13.11	168.28
1925N	5200E	921.38	-11.37	168.19
1950N	5200E	916.60	-10.39	168.18
1975N	5200E	910.01	-9.18	168.15
2000N	5200E	898.74	-7.02	168.08
2025N	5200E	888.55	-5.23	167.96
2050N	5200E	876.96	-3.04	167.74
2075N	5200E	866.71	-1.09	167.61
2100N	5200E	857.63	0.46	167.28
2125N	5200E	848.37	2.17	167.07
2150N	5200E	838.77	4.05	166.96
2175N	5200E	830.65	5.67	166.83
2200N	5200E	819.17	7.96	166.75
2225N	5200E	816.53	8.77	166.82
2250N	5200E	812.03	9.59	166.63
2275N	5200E	807.50	10.53	166.59
2300N	5200E	801.88	11.68	166.58
2325N	5200E	797.99	12.51	166.62
2350N	5200E	794.64	13.23	166.74
2375N	5200E	791.04	13.90	166.83
2400N	5200E	786.94	14.47	166.78
2425N	5200E	777.97	17.03	166.50
2450N	5200E	760.94	19.22	166.23
2475N	5200E	756.83	19.98	166.14
2500N	5200E	749.80	21.31	166.01
1850N	5300E	947.41	-16.55	168.42
1875N	5300E	938.99	-14.85	168.37
1900N	5300E	929.19	-12.97	168.24
1925N	5300E	921.05	-11.37	168.16
1950N	5300E	912.69	-9.90	168.01
1975N	5300E	902.03	-7.98	167.83
2000N	5300E	893.57	-6.56	167.63
2025N	5300E	878.78	-3.77	167.50
2050N	5300E	871.18	-2.33	167.38
2075N	5300E	861.65	-0.49	167.29
2100N	5300E	850.26	1.52	166.97
2125N	5300E	840.11	3.58	166.88
2150N	5300E	830.95	5.41	166.74
2175N	5300E	824.90	6.65	166.58
2200N	5300E	819.70	7.75	166.51
2225N	5300E	815.46	8.68	166.49
2250N	5300E	809.41	9.96	166.49
2275N	5300E	804.43	10.94	166.41
2300N	5300E	800.09	11.86	166.43
2325N	5300E	796.63	12.61	166.52
2350N	5300E	792.13	13.47	166.54

2375N	5300E	736.31	14.47	166.41
2400N	5300E	730.50	15.62	166.44
2425N	5300E	774.67	16.61	166.28
2450N	5300E	765.32	18.34	166.13
2475N	5300E	759.45	19.50	166.09
2500N	5300E	754.67	20.43	166.06
2525N	5300E	749.78	21.34	166.02
2550N	5300E	744.95	22.26	166.05
2575N	5300E	738.84	23.29	165.88
2600N	5300E	728.99	25.04	165.62
2625N	5300E	722.39	26.19	165.42
2650N	5300E	714.14	27.66	165.23
2675N	5300E	710.75	28.40	165.21
2700N	5300E	706.57	29.13	165.04
1950N	5400E	908.30	-9.56	167.63
1975N	5400E	895.99	-7.20	167.52
2000N	5400E	885.71	-5.23	167.45
2025N	5400E	874.63	-3.28	167.16
2050N	5400E	864.95	-1.41	167.06
2075N	5400E	854.52	0.61	166.94
2100N	5400E	847.56	1.92	166.76
2125N	5400E	838.58	3.70	166.64
2150N	5400E	828.86	5.66	166.53
2175N	5400E	825.00	6.51	166.47
2200N	5400E	817.88	7.99	166.47
2225N	5400E	812.01	9.00	166.26
2250N	5400E	804.81	10.32	166.10
2275N	5400E	799.08	11.43	166.01
2300N	5400E	790.91	13.04	165.98
2325N	5400E	786.67	13.97	166.03
2350N	5400E	784.31	14.47	166.07
2375N	5400E	775.74	16.05	165.94
2400N	5400E	768.44	17.44	165.87
2425N	5400E	758.89	19.17	165.75
2450N	5400E	759.19	19.21	165.71
2475N	5400E	755.24	20.00	165.74
2500N	5400E	752.03	20.42	165.61
2525N	5400E	740.57	22.69	165.70
2550N	5400E	733.77	23.78	165.46
2575N	5400E	724.00	25.62	165.34
2600N	5400E	723.48	25.70	165.21
2625N	5400E	716.18	27.10	165.12
2650N	5400E	711.44	27.97	164.98
2675N	5400E	707.83	28.63	164.86
2700N	5400E	704.37	29.27	164.75

EXECUTION TERMINATED

\$SIGNOFF

NORANDA EXPLORATION COMPANY, LIMITED

STATEMENT OF COST

PROJECT Goldstream
TYPE OF REPORT Gravity and Line Cutting

DATE April 1978

a) Wages:

No. of Days 1
Rate per Day \$ 54.73
Dates: from June 20 to
Total Wages 1 x \$ 54.73 54.73

b) Food and Accomodation:

No of days 1
Rate per day \$ 7.46
Dates: from to
Total Cost 1 x \$ 7.46 7.46

c) Transportation:

No of days 1
Rate per day \$ 17.45
Dates: from to
Total Cost 1 X \$ 17.45 17.45

d) Instrument Rental:

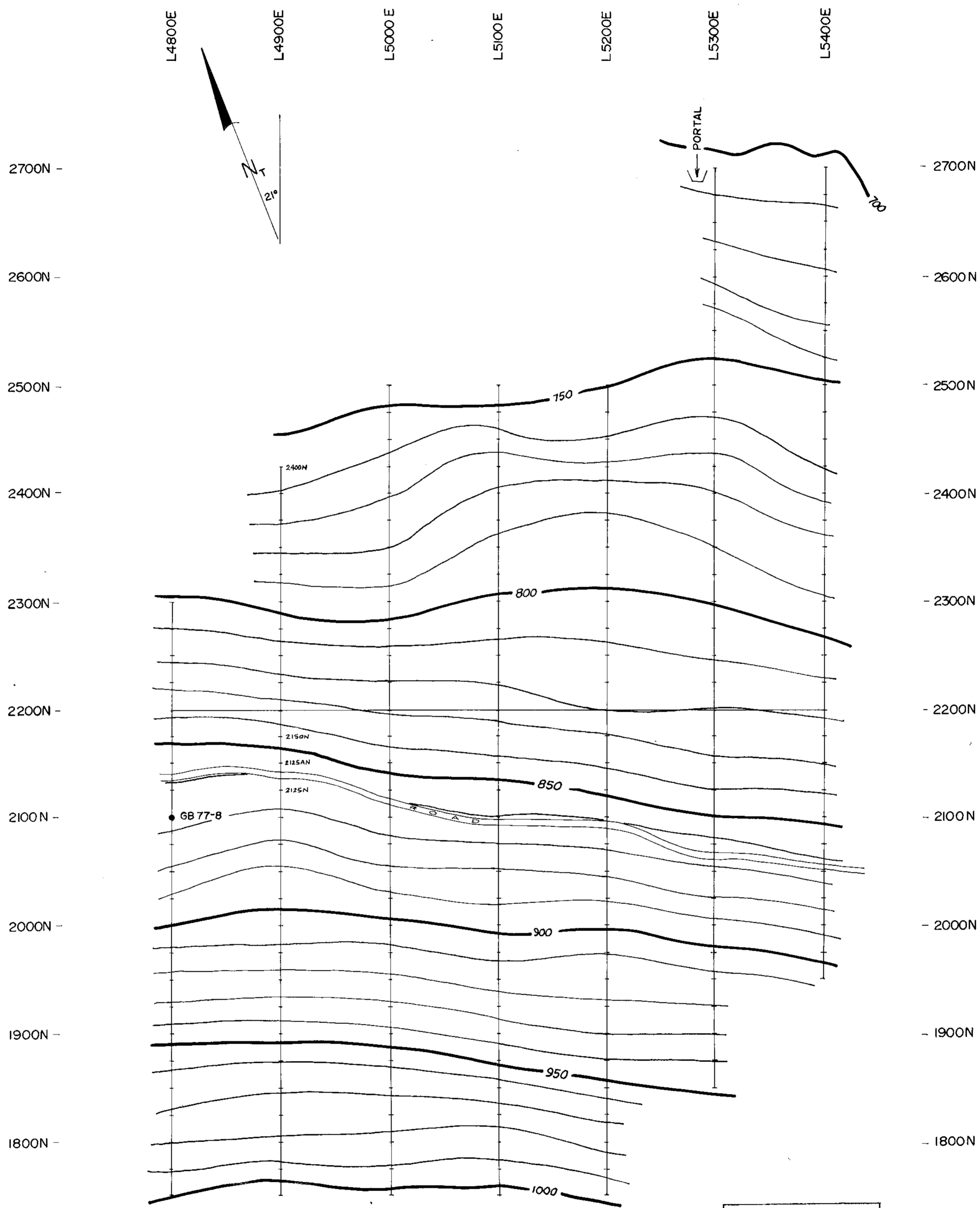
Type of Instrument
No of days
Rate per day \$
Dates: from to
Total Cost X \$

Type of Instrument
No of days
Rate per day \$
Dates: from to
Total Cost X \$

f) Analysis (See attached schedule)		
g) Cost of preparation of Report		
Author		
Drafting		
Typing		
h) Other:		
C.A. Agar & Assoc.	6,545.00	
Snake River Contracting (Line Cutting)	674.13	
Supervision: R.C. Heim, PhD. P.Eng. and G.E. Dirom P.Eng.	360.00	
		<u>7,579.13</u>

Total Cost 7,658.77

e) Unit costs for Gravity Survey		
No of days	7 (Contractors Crew)	
No of units	212 Stns.	
Unit costs	31.72169 / Stn.	
Total Cost	31.72169 x 212	
Unit Cost for Line Cutting		
# of Units	5.05 Km	
Unit Costs	184.90495/Km	
Total Cost	184.90495 x 5.05	<u>933.77</u>
		<u><u>7,658.77</u></u>



CONTOUR INTERVAL = 10 meters

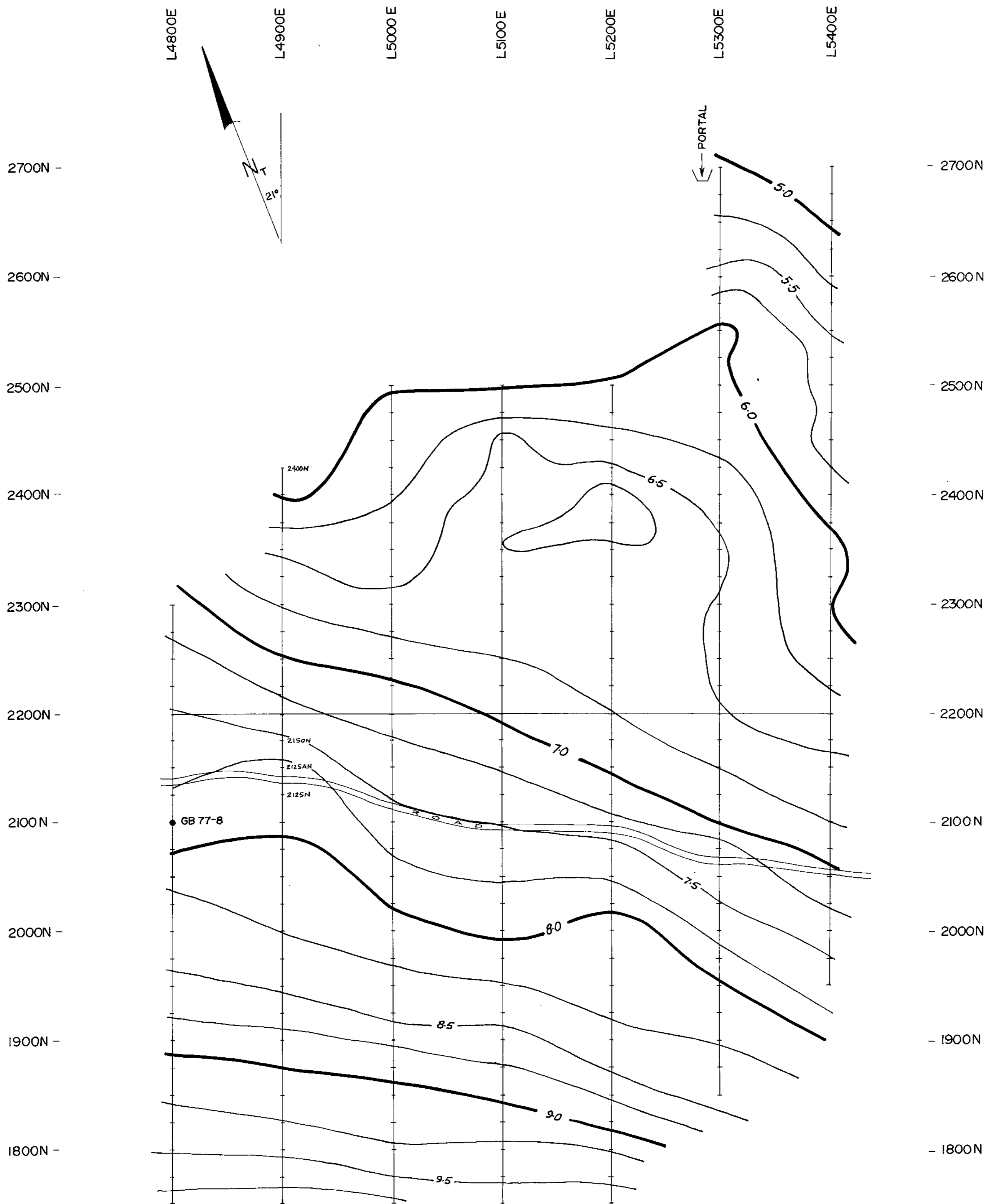
FIGURE 3

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
6696
NO.

**PART 2
OF 2.**

ELEVATION MAP
GOLDSTREAM GRAVITY SURVEY
NORANDA EXPLORATION
GOLDSTREAM RIVER AREA, B.C. NTS 82M-9
SCALE 1cm = 25m
DATE JULY 1977
C.A. AGER & ASSOC. LTD.
SURREY B.C. CANADA

Colin



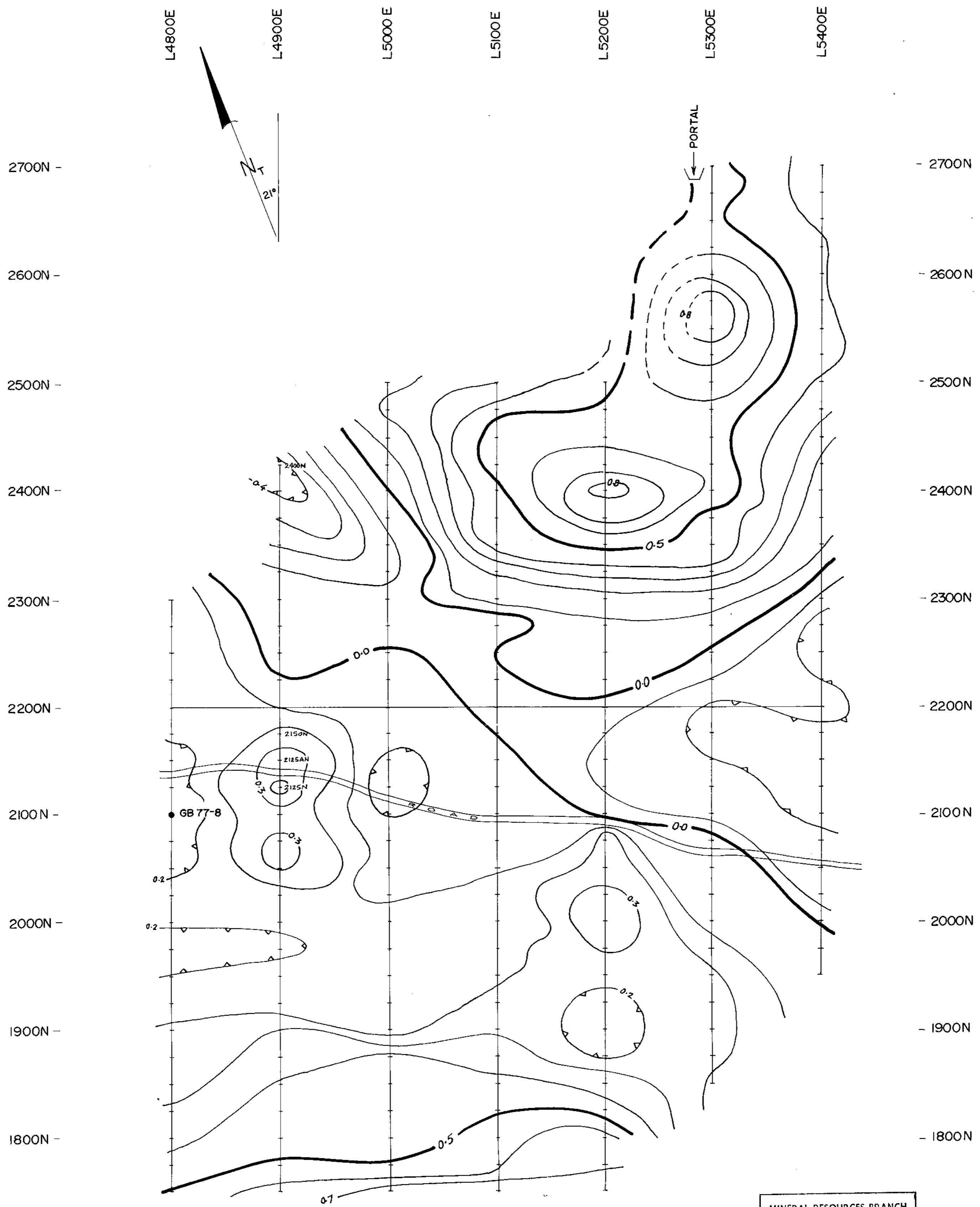
CONTOUR INTERVAL = 0.25 mgal

FIGURE 4

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
6696
NO.

PART 2
OF 2

COMPLETE BOUGUER GRAVITY	
GOLDSTREAM GRAVITY SURVEY	
NORANDA EXPLORATION	
GOLDSTREAM RIVER AREA, B.C. NTS 82M-9	
SCALE 1cm = 25m	C.A. AGER & ASSOC. LTD.
DATE JULY 1977	SURREY B.C. CANADA



CONTOUR INTERVAL = 0.10 mgal

FIGURE 5

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
6696

**PART
2 OF 2**

RESIDUAL GRAVITY	
GOLDSTREAM GRAVITY SURVEY	
NORANDA EXPLORATION	
GOLDSTREAM RIVER AREA, B.C. NTS 82M-9	
SCALE 1cm = 25m	C.A. AGER & ASSOC. LTD.
DATE JULY 1977	SURREY B.C. CANADA

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